

Resource Efficiency and Cleaner Production Primer

“Resource efficiency and clean production” (RECP) Demonstration project in Armenia

EaPGREEN



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“Resource efficiency and clean production” (RECP) Demonstration component project is being implemented in Armenia since 2014. For industrial development projects implementation RECP uses tested preventive environmental approaches: improved efficiency of resources (reduced production costs and materials, energy and water consumption), reduced environmental impact (less waste products and pollution) and improved professional and social health and protection.

In the framework of “Greening Economies in the Eastern Neighborhood” (EAP Green) project the main aim of RECP pilot project is to improve resource efficiency and environmental action particularly in the fields of agricultural/ food production, chemical and construction materials production.

The aim of the efficient and clean production handbook is to locally implement and support the RECP methodology, tools and experience in Armenia.

The publication illustrates several business models and successful examples that were developed by RECP national experts’ team and by the project during 2015-2016 RECP assessment.

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The author of the publication is responsible for the contents; the ideas expressed do not necessarily coincide with EU or other participant organizations point of view.



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“Resource efficiency and clean production” (RECP) pilot project is implemented in cooperation with UNIDO and REC Caucasus.

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INTRODUCTION

Why is it important to develop and implement the “Resource efficiency and clean production” (RECP) project?

What business risks does the RECP mitigate and improve?

What kind of problems does RECP solve? How to achieve the desired goals?

Where to start? How can my business practically apply RECP?

What business benefits could be expected from RECP application?

What tools and methods are used by RECP?

RECP substantially contributes to a successful business establishment.

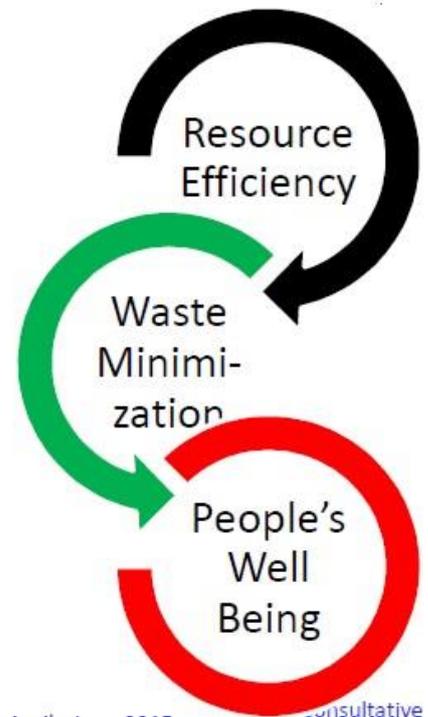
The development and implementation of RECP project is necessary for achieving the main strategic goal of any company operating in a competitive market economy – “better, cheaper, and quicker”.

RECP covers almost all business processes: timely management, main and subsidiary production processes, raw materials, technology stocks management, and forward planning.

RECP solves the problems of increasing the efficiency of raw materials, water and energy exploitation, minimization of waste production and pollution. The results of RECP implementation are economic, environmental and social benefits, improvement of environmental situation.

Introducing RECP enables

- **Reduction of production costs and technological needs;**
- **Increase in labor productivity;**
- **Possible improvement in product quality;**
- **Reduction of costs associated with waste production and pollution;**
- **Possible improvement of production conditions;**
- **Improvement of the company’s status in different kinds of negotiations**
- **Improvement of the public opinion about the company, etc.**



RECP gives fourfold advantages “Win-Win-Win-Win”: that is to say, implementing RECP benefits customers, business, government and nature.

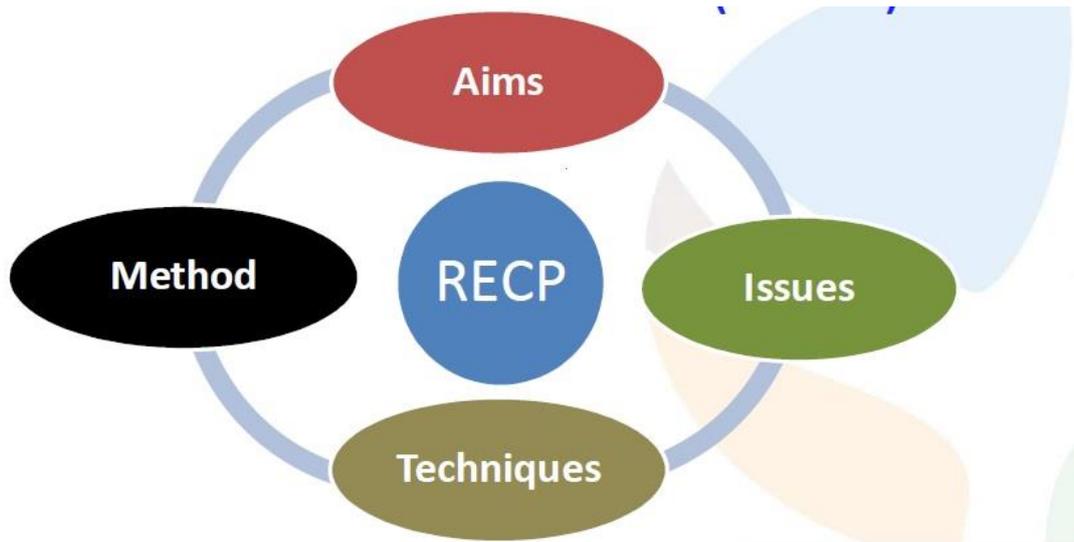
RECP is a policy of no regrets.

This handbook may make your business more successful.

Resource efficiency and clean production (RECP) project

What kind of resources does RECP deal with? What environmental benefits can be expected with introduction of RECP? What productivity and clean production is intended? What is an “environmentally friendly product”?

RECP definition. Integrated and consistent application of preventive environmental behavior and comprehensive methods with the aim of increasing the productivity of goods and services production process and mitigating risks for environment and people.



The aim of RECP project

- Optimization of natural resources (materials, water, energy) efficient exploitation;
- Minimization of the negative impact of production systems on nature and environment by means of decreased waste production and pollution;
- Mitigation of negative impact risks for people and societies and insuring development opportunities.



Resources

Natural resources are components of the environment that are used or can be used as objects of labor, tools or consumption goods.

Natural resources can be exhaustible and inexhaustible, renewable and non-renewable.

For example, the sunlight energy is an inexhaustible resource, plants are renewable resources and minerals are non renewable resources.

Resources are classified by their origin (water, land, biological, climate and mineral resources), as well as by their interchangeability etc.

For example, timber, metal, natural fiber, leather, fur etc. are replaceable resources, but oxygen and fresh water are irreplaceable for people.

Resources can be given by nature or man made. Resources can be economic, labor, financial, etc. Economic resources are material and non material resources used to produce goods and services.

Man, together with all the labor tools, is considered to be the labor resource¹.

Many resources on Earth are on the edge of depletion.

RECP project will mainly discuss the efficient exploitation of the following resources:

- **Materials,**
- **Energy,**
- **Water.**

Efficiency

According to the proverb 'If the ax is blunt, it needs a double force, but the success is in skillful hands'. The main driving force of efficiency is the rational management – by means of expansion and efficient exploitation of the existing resources. Though this idea may seem quite obvious, finding a systemic method for its implementation yet may become a real challenge.

Comparative criteria and indicators are usually used to define efficiency.

For example, energy efficiency is defined as legal, administrative, scientific, production, technical and economical targeted activity - aimed at reducing energy resources specific consumption.

The increase in absolute value of production does not necessarily imply increased productivity or increased efficiency.

With the desire to avoid referring to complex economic concepts in our handbook, nevertheless, to make judgments about business management, analysis and development we need to use some concepts like productivity, efficiency, income, costs, expenditures, cost price of goods, profit, etc.

Performing analysis is connected with classification of incomes and costs that can be done using various features. By the feature of inclusion in the cost price of a product all costs can be divided into direct and indirect costs. Direct expenditures on materials, water and energy comprise the cost price of the product.

Several indicators are used to evaluate the inventory stocks efficiency – material unit average profitability, average consumption of material, average return on a unit of material.

¹ Work is purposeful human activity, during which material and spiritual wealth are created to meet the needs of society. The work process involves the work itself, work substances, work means and work outcomes.:

Clean production

You may ask why we need to spend time, effort and money to improve the environment. People have ignored this aspect for ages.

Those days are left behind; paying attention to environmental problem nowadays is a business direction.

In many leading markets, the environmental security is of crucial importance and application of appropriate standards enables not only to comply with daily tightening legal requirements, but also to meet the increasing consumer demand and develop a profitable business.



Environmental issues already gradually start to influence the decisions to buy particular products in Armenian consumer market.

Recent social surveys indicated that the majority of consumers in developed markets are willing to change their supplier and the brand they are using for the sake of a cleaner and better world surrounding us. This fact alone is sufficient to prove the financial benefits of using “green technologies”.

Ecologically sustainable innovation is a stimulus for a profitable business development.

Eco-sustainable business means doing business that creates exceptional value for customers, shareholders and employees, simultaneously ensuring care and respect for natural ecosystems, humans and societies.

In recent years, environmentally friendly or organic food consumption is getting widespread.²

A product (service) is considered “environmentally friendly” if during the whole life cycle (production, consumption, exploitation) it creates less negative impact on the environment compared to other products (services) of similar category.

RECP BUSINESS BENEFITS

A company performing economic activity makes expenditures and creates income. These important characteristics of performance reflect all aspects of the company’s economic activity.

Income in the reporting period is the increase in economic benefits (value), that may arise from assets inflows or increases or decreases in the liabilities and lead to an increase in shareholders’ capital.³

² As a result of the study, State Commission for the Protection of Economic Competition of Republic of Armenia revealed that some of the business units produced products by “clean products”, “bio”, “eco”, “organic” and similar lettering without proving their relevance grounds.

³ With the exception of the equity investments as a result of the equity increase or decrease in distributions.

Expenditures in the reporting period are decreases in economic benefits (value) that may arise from outflows or decreases in assets or creation or increases in liabilities that can lead to a decrease in shareholders' capital.

Income and expenditure have crucial impact on financial results of a business, which is created by matching them. For this reason, the analysis of income and expenditures has an extreme importance for every business.

The income from operational activities (operational income) comprises the biggest share in a company's total income. It consists of sales revenues and other operational income.

Operational costs mainly comprise the cost price of goods and services sold, distribution and administrative costs and other costs.

RECP project mainly discusses the following business benefits:

- 1. Cost savings**
- 2. Productivity increase**
- 3. Improved product quality**
- 4. Organizational efficiency and effectiveness**
- 5. Licence-to-operate**

In market economy, every company receives financial results from its economic activity that are characterized by profit or loss. The profit is considered the main, total synthetic measure of economic efficiency of a company.

To illustrate the business and environmental benefits that may arise from implementation of RECP methods and tools in Armenian SMEs, the **Appendix 1** represents the analysis of measures suggested and performed in SME companies by RECP national experts team in the framework of RECP pilot project. All measures carried out in experimental companies are classified by RECP tools and methods used business and environmental benefits. Representation of practical examples will greatly contribute to RECP methodology domestication and to the development of current handbook mission.

1. Cost savings (materials, energy, water)

It is known that according to economic concepts/rules

Profit = Income (Total) – Costs.

According to the RA “Law on Accounting”, during profit calculation the total income is decreased by the amount of properly documented costs associated with income. Total annual income is the sum of all kinds of income received during the reporting year (independent of the source).

The expenditures include material costs (including raw materials, water, and energy), expenditures made on producing goods and services, capital and current expenditures on fixed assets, depreciation costs, salary remunerations, social security costs, taxes, duties, etc. Physical losses are also classified under expenditures, for example losses that may occur during delivery, maintenance and sales due to physical and chemical processes and unfavorable weather conditions.⁴ It is possible to reduce costs using various RECP tools.



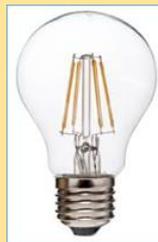
Cost Savings example (Food Industry)

Armenia, Ararat region, Ararat village



In “Ararat Abricon” LLC internal and external lighting systems incandescent and metal halogen lamps⁵ were replaced with energy efficient (fluorescent and LED) bulbs, resulting in about 450 thousand AMD annual reduction of electricity expenditures. At the same time the reduction in carbon dioxide emissions amounted to around 4.3 tons annually

Internal and external LED lamps



Business benefits from RECP implementation: **Cost savings**. RECP environmental benefits: **Selection and efficient use of energy source** and **Reduction and controls over emissions**, RECP tools used: **Good housekeeping** and **Technology change**.

"People are becoming rich not only by increase of their belongings but also by cost reduction" Aristotle

⁴ In the accounting legislation, there are other deductions that relate to the purely accounting procedures, such as receivables and payables and the write-off of bad fame, discovered or understated income of overstated deductions, etc.

⁵ Currently, many countries have been implementing the policy of incandescent lamps gradual removal, in the EU, Russia and elsewhere.

2. Productivity increase (Reduction of non-product outputs)

The increase of productivity is the main condition on the way of enhancing production, enlarging personal and national wealth and increasing the welfare of the population.

The increase of productivity results in sparing materials, energy and water, decreasing production costs and increasing profitability.

Decreasing the amount of materials required for a unit of production and decreasing waste production results in increased labor productivity, which lowers the cost price of production.

Finally, the increased labor productivity contributes to improvement of working conditions, as the workforce and workers' health is preserved, which in turn further increases the labor productivity.

The concept of labor productivity implies a measure of work efficiency or in other words - the ability to produce a certain amount of goods and services in a unit of time.

Nowadays the issue of increasing productivity is of a crucial importance in our country, because our economy remains in unfavorable social economic condition.

In current situation it is very important to base on own scientific force, consolidate all strengths and resources in order to introduce new technologies, stimulate business activities and in this way to increase productivity.



Productivity increase example (Food Industry)

Armenia, Kotayk region, Hrazdan City



Following the principles of RECP, “Lilit Ghukasyan” PE has doubled its productivity in a quite short period. The PE is producing pastries and confectionery in the city of Hrazdan. They plan to expand their industrial areas and implement several environmental and resource-efficient activities, especially the transition from the use of liquefied petroleum gas to environmentally friendly fossil fuel (natural gas) and renewable energy sources.

Business benefits of RECP: **Productivity increase. RECP environmental benefits: Selection and efficient use of energy source and Reduction and controls over emissions. RECP tools used: Good housekeeping, Input Change, Better process control.**

“Business continues to grow as long as developing its own advantages”.

Herbert Newton Casson

3. Improved product quality (Better product from better-controlled processes)

In market economy, one of the key concepts of economic activity of a firm is product quality improvement.

Market poses high requirements for the quality of products. At the same time, many firms make a lot of efforts towards gaining leadership in their market segment. The issue of product quality becomes the basis for the firm's business strategy and the guarantee of its financial sustainability.



The profitability of the firm becomes driven by the existence of Product Quality Control (PQC) system.

The concept of quality implies a synergy of consumer characteristics of a product, which meets the needs of consumers.

In market economy, the product quality improvement issue for a firm must be considered as an important factor of production and sales strategic controls, which affects its financial success. It must contribute to a steady increase in the firm's business activity and successful competition – with the aim of ensuring financial stability.

International practice attests that introducing an efficient PQC system enables firms to increase their profitability levels 3-4 times on average.

Product quality improvement example (Food Industry)

Armenia, Ararat region, Lusgyugh village



Air ionization equipment and air and water sterilization systems were installed in cheese and yogurt producer “Arame and Sofi” LLC - as a measure of preventing materials and products from possible perishing⁶.

This non-chemical sterilization method at the same time enables to increase the cooling temperature by 1-2 degrees, which results in lower energy costs.

Business benefits of RECP: **Improved product quality**. RECP environmental benefits: **Selection and efficient use of materials and energy** and **Reduction and utilization of waste** and **Reduction and controls over emissions**, RECP tools used: **Good housekeeping, Input Change, Better process control, Equipment Modification**.

“Most important, the most fundamental value that will never, never to be questioned, is integrity.”

Art de Guus

⁶ The cost of equipment installation is 50 thnd AMD, the positive impact levels are still under examination

4. Organizational efficiency (Staff motivation, promotion and encourage business processes)

Administrative efficiency characterises the performance of the work carried out – productivity, or the amount of products and services produced within a unit of time (hour, shift, day, month, year).

The market poses some principal requirements for the firms' activities – to investigate alternatives for management decisions, perform a comparative analysis, choose the most effective alternative and measure the financial results of its implementation.

The improvement of administrative efficiency will have a positive impact on planning the resource exploitation, on development of engineering skills, management of business conduct, market conduct, on insuring accurate quality controls over production processes.

As a result of staff inclusion in business activities of the company, motivation and remuneration activities cost reduction and decrease of waste production, a better controls over processes and quality improvement can be achieved, the status of the firm in various negotiations can be strengthened and the public awareness about the company can be improved.



Organizational efficiency improvement example (Food Industry)

Armenia, Syunik region, Kapan City



Several measures have been implemented in dairy and meat products producer “MARILA” LLC, including the following: Market research concerning issues of returning unsold goods, sales stagnation, food transportation and conditions of storing the food in sales points. Sensors were installed on production unit lamps, temperature controllers/regulators were set on heating system batteries (reduction of energy consumption by 20%):

Measures taken reduced the emission of greenhouse gases by 8.4 tons.

Business benefits of RECP: **Organizational efficiency, Cost savings.** RECP environmental benefits: **Reduction and utilization of waste and Reduction and controls over emissions,** RECP tools used: **Good housekeeping, Better process control.**

" The first prerequisite for Business success is patience."

John Rockefeller

5. Licence-to-operate (Government, community and markets)

The government, the community, local, regional and international markets set specific rules to achieve business regulation, promotion of environmentally friendly economic activity, ensuring secure conditions for the health of people⁷.

These rules are enacted through licensing process, product certification, normative regulations and bylaw decisions on waste production and recycling.

Creating equal conditions in markets for newly entering firms is a matter of promoting competition for governments⁸. There are certain requirements for entering international markets concerning qualitative features of products, controls over the production process, reliable guarantees for minimization of the negative impact of pollution on environment and the health of population.



Licence-to-operate example (Chemical industry)

Armenia, Yerevan City

Construction of treatment plant in “Kashi” OJSC created the opportunity to enter international markets and created sales opportunities for half-manufactured products and final goods. The treatment station was constructed with joint efforts from US International Development Agency “Sustainable Water Resources Management for Enhanced Environmental Quality” and “Agribusiness Small Medium Enterprise Market Development (ASME)” projects. At the same time, the possible negative impact on Hrazdan river and the surrounding area was reduced.



Business benefits of **RECP: Licence-to-operate**. RECP environmental benefits: **Selection and efficient use of water source and Reduction and treatment of wastewater**. RECP tools used: **Good housekeeping, Better process control, Equipment modification**.

"It is essential to maintain Synopsys, fair and reliable partner's reputation and guide them. Our integrity should be irreversible, are the key to our success. "
Chi-Foon Chan

⁷ The sanitary and epidemiological rules and norms and hygienic standards are being developed and applied on the human body to the harmful effects of exclusion.

⁸ The companies are, however, often display behavior as unfair competition, due to availability of goods and commodities markets relatively low ability to pay by population.

RECP OBJECTIVES AND ENVIRONMENTAL PROFILE



Increasing resource productivity - materials, water and energy.

Decreasing pollution intensity - emissions, waste water and waste.



Selection and efficient use of materials



Reduction and utilization of waste

Selection and efficient use of water source



Reduction and treatment of waste water



Selection and efficient use of energy source



Reduction and controls over emissions

The RECP objectives include a correct selection and efficient exploitation of materials, energy and water sources in terms of time and location for production process purposes.

The environmental benefits that are expected from RECP tools and methods implementation are minimization, neutralization, recycling, and management of waste production, wastewaters and pollution.

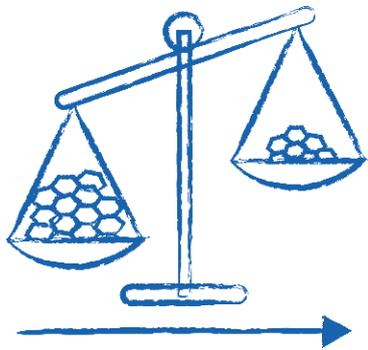
All business cases presented in the Primer are compiled during 2015-2016 based on "RECP audits", preliminary estimates and results conducted by the RECP experts.

The investigations aimed at improving the effectiveness of the enterprise activities are carried out in the agriculture, food, chemical and construction materials industries of the twenty-two pilot organizations.

Also the recommendations made by the "RECP Rapid assessments" for twenty eight SMEs engaged in the "Green RECP clubs" are used as well.

Summary information on industrial and environmental situation in Armenia is represented in **Appendix 2**.

1. Selection and efficient use of materials



RECP discusses: stocks and raw materials obtained from external suppliers, own resources, auxiliary materials (materials that do not become a product), intermediate products (that comprise a part of the final product), wrapping materials, etc.

Standards and indicators: absolute and specific quantities of consumed materials, the efficiency of material exploitation.

Measurement units: (ton, liter, quantity, currency, etc.) /year or unit of production.

The large share in a company's current assets belongs to production stocks, especially in recent years, due to the increase in competition, loss of sales markets, low income of the customers, high levels of production cost price and other factors. The wrong selection of materials and their further inefficient exploitation, increasing stocks of unsold production lead to current assets and cash flows freezing, payables increasing and consequently - solvency decreasing and financial unsustainability of the company that may eventually result in bankruptcy.



Example of Selection and efficient use of materials (Food Industry)

Armenia, Ararat region, Ararat village

Confectionery producing company "Arminashogh" Ltd makes the use of simultaneous production factories and stores not only in Ararat, but also in the capital – Yerevan. The most important priority is the modernization of the ventilation system in the biggest factory producing bread and confectionary. There are several other issues concerning the modernization of the equipment and the bread-pulp mixing system. The company operates in a very competitive environment and the only way to survive is through improving the quality of the products and reducing the costs⁹.



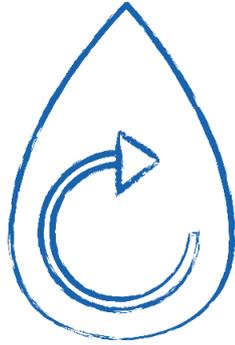
"Arminashogh" Ltd successfully ensured the reception of new products thanks to refunds/buybacks (around 10% of the overall production). Following the trainings and suggestions from "RECP Green Clubs," as well as the initial evaluation, the company started to produce rusk and returned lavash and "Matnaqash" bread types. The equipment is purchased (worth around 4,000 EUR) and rusk supply contracts are already signed. Packaged products are available in stores. As a result, payback period is about two years.

Business benefits of RECP: Cost savings, Organizational efficiency, Licence-to-operate.

RECP environmental benefits: Selection and efficient use of materials and Reduction and utilization of waste, RECP tools used: Good housekeeping and Input Change.

⁹ The company of In terms of "Growth rate" RA commercial companies occupying first place in 2016, and won the "Leader of the Branch" title, which will be the market's reliability and long-term guarantee.

2. Selection and efficient use of water source



Water can be obtained from the following sources: urban or community water pipes, surface waters (water reservoir, lake, river, etc.), underground water sources (including own artesian wells), gathered rainwater, wastewaters of other companies, etc.

Standards, indicators: absolute and specific levels of water consumption, water exploitation efficiency.

Measurement units: (ton, cubic meters, liters, currency, etc.)/ Year or unit of production.

The sectorial water consumption of RA has the following structure: 88% of the share belongs to irrigation, fisheries and forestry sector, 8% - to the industry sector, 4% - to household consumption of potable water.

There are no large rivers in Armenia except river Araks. Nevertheless the river network is quite thick (215 rivers of lengths over 10 km) with a total length of 13 thnd kms.

Most of these rivers do not have a permanent flow and dry out in summers. The spatial and seasonal distribution of Armenian water resources is extremely unequal. Water resources are scarce in the densely populated Hrazdan river catchment basin, which is located in the central part of Armenia. The correct selection and efficient exploitation of water sources is highly important for fisheries. Optimal conditions require that the oxygen saturation of water ranges between 65-75%, water temperature for sturgeons ranges between 18-19 °C and for salmon fishes – between 13-15 °C, which ensures high growth rates for fish production. Water supply through gravity flows of artesian waters, quality water with constant temperature, correct balance of combined vitaminized mineral fodder and sunny weather give an opportunity to grow a 1.5 kg trout in less than 12 months.



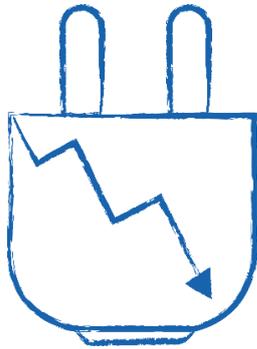
Example of Selection and efficient use of water source (Production of Construction Materials) Armenia, Lori region Vanadzor City



The producer of decorative tiles “Martin Tovmasyan” PE chose rainwater as a water source for cement-sand mixture. Using the rainy climate of Vanadzor, the PE has created a water collecting system (a water tank with the capacity of 2 tonnes), through which rainwater is used in the production process. The collected water is sufficient for the whole production, thus the city’s main water system is not used.

RECP measures environmental benefit: **Selection and efficient use of water source** and **Reduction and treatment of wastewater**. **RECP** business benefits: **Productivity increase, Organizational efficiency, Licence-to-operate**. **RECP** tools used: **Good housekeeping, Input Change, Technology change**.

3. Selection and efficient use of energy source



RECP expects that energy consumed by a firm may include exploitation of the following energy sources: locally produced electricity and thermal energy (sun, wind, water energy, natural gas, oil, coal, biofuel, solid waste, etc.), centralized electricity supply, heat supply, refrigeration, steam supply, engine energy (gasoline, diesel, biofuel) etc.

Standards, indicators: consumed energy/ efficiency of absolute and specific consumption of energy.

Measurement units: (ton, cubic meters, liters, currency, etc.) / year or unit of production.

Armenia does not possess own energy resources and satisfies its needs by importing energy. Natural gas is the main source of energy (75-80%); gas coverage is 96% across the country. The main consumers of energy are housing sector (around 30%), transportation sector¹⁰ (around 25%) and energy sector (between 20-35%). Electricity is produced in Thermal power stations (30-40%), in Nuclear power plant (20-35%) and in Hydroelectric power plants (20-30%). The selection and efficient exploitation of energy source are important issues in food, chemical productions and manufacturing of construction materials.



Examples of Selection and efficient use of energy source (Food Industry)

Armenia, Aragatsotn region, Aghdzk community

Several measures directed on efficient exploitation of energy resources, including changing the energy source, were applied in Astarak Dzu LLC, a company working in the egg production industry. Aviaries and secondary spaces are heated with natural gas, instead of electricity¹¹. Mercury lamps were replaced with energy efficient (sodium and LED) lighting fixtures in external lighting system¹²: At the same time, as a result of energy efficiency measures applied in the LLC, the emissions of greenhouse gases has decreased by around 24 tons of CO₂ equivalent annually.

Natural gas heating



External and internal LED lighting fixtures



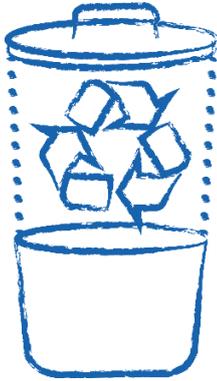
RECP measures environmental benefits: Selection and efficient use of energy source and Reduction and controls over emissions. RECP business benefits: Cost savings, Organizational efficiency. RECP tools used: Good housekeeping, Input Change, Equipment modification and Technology change.

¹⁰ Around 60 % of transport operates on compressed natural gas.

¹¹ Annual financial savings or cost reductions of 750 thousand AMD.

¹² The reduction of energy costs amounted to 330 thousand AMD. The walls of newly built poultry yards were heat insulated using locally produced perlite plates. It was suggested to obtain energy from the air ducts by installing recuperators. The expedience of constructing a combined (cogeneration) electricity and thermal energy plant working on biofuel was also considered.

4. Reduction and utilization of waste



According to RECP, methodology amounts of the following types of waste products resulted from the production process is being considered: waste materials sent to trash site, landfilled, neutralized, sent for recycling, hazwaste materials, farming waste, gardening waste, urban solid waste etc.

Standards, indicators: absolute and specific indicators of waste production, waste production intensity.

Measurement units (ton, cubic meters, liters, currency, etc.)/ year or unit of production.

48 of solid waste sanitary landfills existing in Armenia are going to be closed; the waste is going to be sorted and by means of 10 loading points is going to be transferred to 5 new regional landfills. In major closed landfills (Yerevan, Gyumri, Vanadzor) landfill gas is intended to be extracted and burnt and the open burning of solid waste products is intended to be stopped. Primary products, materials, scraps, remainders of other products or materials, as well as

products that have lost their initial consumer characteristics are considered to be waste products of production and consumption. Waste products with physical, chemical or biological characteristics that constitute or may constitute danger to human health or the environment are considered hazwaste and must be dealt with special methods, means and techniques.

According to the “Law on waste products” of RA, legal entities engaged in waste products utilization are required to register the waste products produced, utilized, neutralized and transferred to third parties in the way stipulated by the law.



Example of Reduction and utilization of waste (Chemical Industry) Armenia, Yerevan City

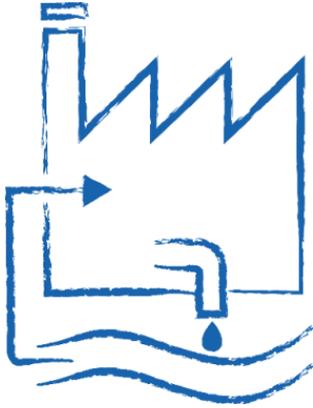


An interesting option for waste reduction was introduced in “KASHI” OJSC, with the help of RECP. The remainders of materials: salt and pieces of leather are reused in livestock farms as a fodder admixture, as well as a component in organic fertilizer extraction process (compost).

It is a typical example of a case, when waste from one production process becomes an input for another production-creating basis for bilateral successful cooperation.

RECP measures environmental benefits: **Selection and efficient use of materials** and **Reduction and utilization of waste**. **RECP** business benefits: **Cost savings, Productivity increase**. **RECP** tools used: **Good housekeeping, On site reuse/recycling**.

5. Reduction and treatment of wastewater



Waste waters created during production and disposed of from the territory of the firm by pipelines, in bins, or other transportation means, outflows of water for production purposes, sanitary cleaning needs or unexpected outflows of water (the volumes are being measured or estimated), the effluent penetrating through soil and other outflows are being considered according to RECP methodology.

Standards, indicators: absolute and specific indicators of waste water production, outflow intensity.

Measurement units (ton, cubic meters, liters, currency, etc.)/ year or unit of production.

Urban wastewaters include household and industrial wastewaters. In past there used to exist 20 wastewater cleaning stations in Armenia, with a total capacity of 958 thnd m³ per day. Currently the stations are in an extremely bad condition or totally damaged, except reconstructed mechanical cleaning stations located in Martuni, Vardenis and Gavar. Decrease of wastewaters is a result of the decrease in population, more rational use of water resources and the decline of the industrial sector. In the largest cleaning station “Aeratsia”, located in Yerevan a partial mechanical cleaning of wastewaters is carried out. Currently there is an ongoing modernization project for “Aeratsia” cleaning station.

Biological cleaning of wastewaters, sludge removal, methane extraction is not performed in Armenia, and cleaning stations factually represent shallow pools called “defecate pools”, which emit a great amount of organic materials and greenhouse gases.



Example of Reduction and treatment of wastewater (Food Industry)

Armenia Armavir region Lukashin village



RECP pilot project implemented several wastewater reduction measures in dry fruit producing “Lukashin agricultural association” cooperative company.

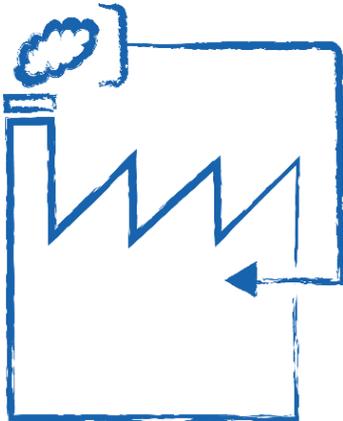
Wastewater effluent during initial cleaning of material is used for adjacent territory irrigation.

Reuse of third stage cleaning (rinsing) waters for initial cleaning process reduced the consumption of drinking water by 30%. Giving up on using caustic soda for initial processing of some fruits reduced the volumes of harmful wastewaters and decreased production costs.

RECP measures environmental benefits: **Reduction and treatment of wastewater.** **RECP** business benefits: **Cost savings, Productivity increase, Organizational efficiency.** **RECP** tools used: **Good housekeeping, Input Change, Technology change.**

6.

Reduction and controls over emissions



Air pollution considered in the framework of the RECP include the following:

Contamination due to own production of electricity and thermal energy (hot water and steam) and purchased energy (centralized electricity, heat and steam supply). Other burning processes, physical and chemical processing, getaway emissions, etc.

Standards, indicators: absolute and specific indicators of greenhouses gases emission, emission intensity.

Measurement units. (ton CO₂ equivalent, cubic meters, currency, etc.) / year or unit of production.

Every year approximately to 10 000 mln tons of oil equivalent energy is consumed in the world. Global warming has the biggest impact of energy consumption on the environment. Climate change or global warming is the average global increase in the earth surface air temperature. The most important greenhouse gas is the carbon dioxide (CO₂) the emission of which is a result of fossil fuel burning, which comprises 80% of the manmade emission of carbon dioxide.



Methane (CH₄) is the second important greenhouse gas and nitrogen suboxide (N₂O) is the third. The global warming potential (GWP) of greenhouse gases is estimated for the equivalent of CO₂ and the three more widespread GHGs, the potentials are equal to: CO₂ =1, CH₄ = 21, N₂O = 310¹³. The “Carbone footprint” is the amount of greenhouse gases that anyone emits as a result of some activity.

Example of Reduction and controls over emissions (Food Industry)

Armenia, Lori region Vanadzor City



“Meghratoun” Ltd is producing honey and non-matured wine. The company pays great attention to environmental issues: light bulbs are converted to LED lights and walls are heat-insulated with polystyrene foam tiles. The company also plans to install solar battery panels, which will result in significant savings in natural gas and electricity consumption, as well as in reduction of greenhouse gas emissions. According to calculations, yearly savings will comprise around 230,000 AMD. In addition to environmental benefits, the use of solar power and other renewable energy sources can significantly increase the company’s reputation.

RECP measures environmental benefits: **Selection and efficient use of energy source** and **Reduction and controls over emissions**. **RECP** business benefits: **Cost savings** and **Licence-to-operate**. **RECP** tools used: **Good housekeeping, Input Change, Equipment modification** and **Technology change**.

¹³ According to 2007 IPCC Fourth Assessment Report (AR4), GWP of this GHG are equal to 1 for CO₂, 25 for CH₄, and 298 for N₂O, but while preparation of national reports still 1995GWP data referred in the text is used.

RECP TECHNIQUES

There are various methods and tools for resource efficiency and clean production. After analysing the importance of the implementation of environmentally friendly technologies and efficient business development, RECP project classifies the tools and methods in the following format.



- 1. Good housekeeping,**
- 2. Input Change,**
- 3. Better process controls,**
- 4. Equipment Modification,**
- 5. Technology change,**
- 6. On-site reuse and recycling,**
- 7. Useful byproduct,**
- 8. Product modification.**

In market economy the company projects and implements its economic activity itself. In doing so the company relies on the contracts signed with suppliers and customers and projects its further development based on consumer demand. Any company can use RECP methods and tools to achieve its strategic and production goals and to benefit in various ways.

For example, as a result of improved housekeeping and input material change, the reduced material consumption of production can lead to sparing material stocks and enable producing additional quantity of products. Better process controls, consistent modification and proper maintenance of equipment and production lines will help in planning and ensuring production of necessary quality products.

Development and implementation of new advanced technological processes, installation of new improved equipment, their timely maintenance, management and improvement of production processes, simultaneous usage of renewable energy sources, efficient consumption of fossil fuel and water together with advanced technologies bring various business and environmental benefits.

Product modification, on-site reuse and recycling¹⁴ as well as useful byproduct production minimize waste generation.

¹⁴ Waste recycling - technology connected with changing physical, chemical or biological characteristics of waste.

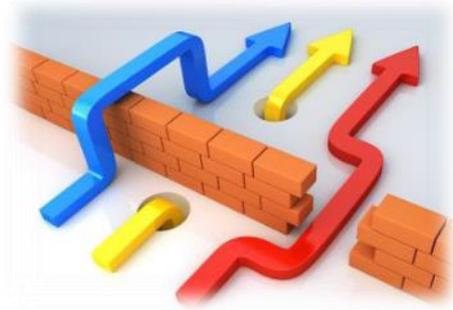
1.

Good housekeeping

Change of exploitation and operation procedures, management and business practices, minimization of ineffective work and losses, care and motivation.

Examples of Good housekeeping practices

- ✓ Switch off what is not in use,
- ✓ Repair the equipment in time,
- ✓ Target usage of workspace property,
- ✓ Keep workplace organized and clean,
- ✓ Discuss and approve the cost efficient and technically correct solutions for tasks,
- ✓ Prevent material losses,
- ✓ Minimize water and energy losses,
- ✓ Implement the exploitation and maintenance rules properly,
- ✓ Preserve the caring and motivated behavior of the staff.



Example of Good housekeeping (Production of Construction Materials) Armenia, Shirak region, Myisyan village



In “HATM” household union that produces construction materials and furniture currently used administrative spaces were optimized and matched with current production volumes¹⁵. As a result of several taken measures¹⁶ there is an annual saving of costs of about 2.7 mln AMD.

At the same time, the electricity consumption is reduced, and emissions of CO₂ decline by around 30 tons.

RECP tools used: Good housekeeping, Better process control. RECP business benefits: Cost savings, Organizational efficiency. RECP environmental benefit: Selection and efficient use of energy source and Reduction and controls over emissions.

"Anything you can do better than has been done until now."

Henry Ford

¹⁵ This is typical to many post Soviet Union economies.

¹⁶ The heating surface of administrative sector decreased by 280 m², infrared heating system was installed in the manufacturing sector, unnecessary use of the transformer was reduced, and the power supply system modifications were made.

2.

Input Change

Use of alternative input materials, so that less or less harmful waste is created. Simultaneous use of renewable resources and less problematic and harmful materials.

Typical examples and solutions:

- ✓ Use less harmful substances,
- ✓ Use materials for their purpose,
- ✓ Use raw materials and inputs from local sources,
- ✓ Recycle¹⁷ and utilize¹⁸ waste,
- ✓ Use of renewable energy in all possible cases,
- ✓ Organize secondary use of materials, water and energy,
- ✓ Use sustainably-sourced renewable materials,
- ✓ Continuously look for ways to replace the use of harmful substances,
- ✓ Use materials with longer biocycle where possible.



Example of Input Change (Food Industry)

Armenia, Armavir region, Yervandashat village



By combining electric and solar drying units, a technology change for dry fruit production was performed in “Ervandashat agricultural association” consumer cooperative company. As a result of using solar energy the saving of electricity amounted to around 75% or 4.7 MWh annually. Emissions reduction amounted to 2 tons of CO₂ eq. The annual saving is equal to 200 thnd AMD and the payback period is 10 months. There are evident environmental benefits.

RECP tools used: **Input Change, Technology change and Equipment modification.**

RECP measures business benefits: **Cost savings, Improved product quality.**

RECP environmental benefits: **Selection and efficient use of energy source and Reduction and controls over emissions.**

“You will never be able to solve the problem, if you store the same thinking and the same approach that led you to this problem.” Albert Einstein

¹⁷ Waste utilization- use of waste to produce goods, energy or for other purposes.

¹⁸ Waste recycling – reuse of waste as a secondary material or energy source.

3.

Better process control

Improve control over processes and equipment in order to operate those continuously at highest efficiency and lowest wastage.

Typical examples and solutions

- ✓ Continuous implementation of standard operating practices and process monitoring,
- ✓ Improvement of working procedures,
- ✓ Ensure the proper execution of equipment and mechanisms operational tasks,
- ✓ Keep operational records and analyze equipment bugs,
- ✓ Periodical and current trade and technical accountability of raw materials, energy and water and results analysis,
- ✓ Improvement of automated production systems,
- ✓ Introduction of quality controls systems,
- ✓ Development conditions for production systems that provide maximum efficiency and minimum waste and emissions,
- ✓ Execution of preventive maintenance in order to reveal possible damages in advance.



Example of Better process control (Food Industry)

Armenia, Kotayk region, Abovyan City



The production process control has been strengthened in “Sam-Har” Ltd, which produces 15 types of compotes and preserved jams, two types of jams, 10 types of natural juices and 4 types of pickles. Additionally, the storage space of the company has been optimized bringing environmental and business benefits.

RECP tools used: Better process control, Good housekeeping. RECP measures business benefits: Cost savings and Organizational efficiency. RECP environmental benefits: Selection and efficient use of materials and energy source, Reduction and utilization of waste and Reduction and treatment of waste water.

“An ounce of prevention is worth more than a pound of cure” Rene Van Berkel

4.

Equipment Modification

Replacement of production processes, technological equipment and improvement of technical means with the purpose of avoiding wastages, losses or overruns, reducing waste and emissions and improving efficiency.

Typical examples and solutions.

- ✓ Proper selection and maintenance of production lines, equipment and mechanisms,
- ✓ Improvement of production processes (whipping, mixing, supplying, transferring, selling, refurbishing, storing etc.),
- ✓ Improvement of equipment operating conditions (temperature, pressure, speed etc.),
- ✓ Using rational solutions in energy distribution and consumption systems for production and utility purposes,
- ✓ Optimization of production procedures through pooling steps and stages of some processes.
- ✓ Fully ration exploitation of available equipment,
- ✓ Insulation etc.



Example of Equipment Modification (Food industry)

Armenia, Lori region Vanadzor City



“Roz Fruit” cannery annually processes over 150,000 kg of vegetables and fruits and produces around 80 various types of products, including jams, conserved and frozen vegetables, compotes, natural juices, etc¹⁹. The replacement of the old (morally and physically worn-out) steam boiler with the new one can save up to 5,600 m³ natural gas, or 53,300 kWh energy, or 1,600 Euros. The reduction of annual greenhouse gas emissions will comprise about 11 tonnes of CO₂ equivalent, the required investment is about 5,000 Euros and buyback is around 3 years. The increase of safety and reliability in the production process is also obvious.

RECP tools used: Equipment Modification, Good housekeeping and Technology change. RECP measures business benefits: Cost savings and Organizational efficiency. RECP environmental benefits: Selection and efficient use of energy source and Reduction and controls over emmissions.

“When I did not have enough money - I sat down to think, instead of running make. The idea - the most expensive product in the world.”

Steve Jobs

¹⁹ The company does not use any preservatives or chemicals (artificial vitamins, preservatives, E group compounds, etc.) and food preservation purposes, the products used are products fresh water, sugar, salt and some natural spices.

5.

Technology change

Replacement of (process) technology with more efficient and/or less wasteful technology.

Typical examples and solutions

- ✓ Changes in main production processes:
 - Shift from chemical to mechanics,
 - Using multistage technologies,
 - Change of process chemistry, e.g. to catalytic or solvent free,
 - Minimize the use of synthetic cleaning substances in order to reduce the outflow of non biodegrading organic substances,
- ✓ Use of effective boilers, engines,
- ✓ Use of renewable energy sources for electricity and heat production purposes (electricity, heating, cooling, hot water),
- ✓ Changes in materials processing and synthesis in order to reduce emissions,
- ✓ Use of equipment with regeneration loops,
- ✓ consideration of advanced options for process segregation etc.



Technology change example (Food industry)

Armenia, Lori region Vanadzor City



The producer of prepared and frozen foods “Lusine Baratyan” PE was provided with technology improvement suggestions, which will help them to save raw materials, energy and water.

The PE is continuously perfecting its products through improvements in the main production process.

RECP tools used: Technology change, Equipment Modification, Input Change and Better process control. RECP measures business benefits: Productivity increase, Improved product quality, RECP environmental benefits: Selection and efficient use of materials, Reduction and utilization of waste and Reduction and controls over emissions.

“The difficulty is not to find new ideas, and to get rid of the old ones.”

John Maynard Keynes

6.

On-site reuse and recycling

Useful application of waste (material, energy, water) within the same company for similar or alternative purpose

Typical examples and solutions

- ✓ Reuse of waste for producing goods, energy or for other purposes,
- ✓ Using the waste created during initial processing of materials in the production process of other goods,
- ✓ Waste utilization: using as a secondary source of material or energy,
- ✓ Countercurrent or cascaded use of water and energy,
- ✓ Condensate and heat recovery, heat recuperation,
- ✓ Reuse of incoming packaging for outgoing products,
- ✓ Using the products that have lost their initial consumer characteristics or cleaning solvents in the production process for other goods or for next batch of products,
- ✓ Using the cleaning solvents and waste water flows for irrigation and other purposes.



Example of On-site reuse and recycling (Carpets Industry) Armenia, Kotayk region, Hrazdan City



Producer of rugs and carpets “Isahak Melqumyan” PE gave a new breath to the Armenian traditional carpet production technologies. Yet, the waste from the production of wool can be used to produce pressed thick felts. Likewise, the cotton fibres can be used for the production of candle filters. As a result of RECP approach individual entrepreneur additional annual earnings in the first year will be about 450 thousand drams.

RECP tools used: On-site reuse and recycling, Good housekeeping and Useful byproduct. RECP measures business benefits: Productivity increase and Licence-to-operate, RECP environmental benefits: Reduction and utilization of waste .

"Failure is simply the opportunity to start again, this time in a more reasonable manner." Henry Ford

7.

Useful byproduct

Convert a previously wasted material into a substitute input material for another company or user.

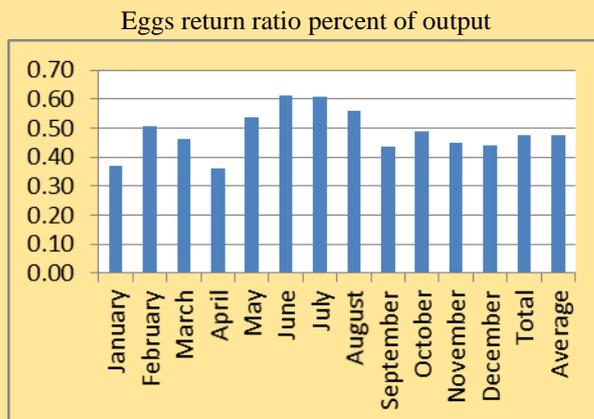
Typical examples and solutions

- ✓ Provision of used heating or cooling water for external heating or cooling purposes (buildings, fish farms etc.)
- ✓ Segregation of useful byproducts for processing and recycling (as well as for selling to other companies).
- ✓ Industrial symbiosis²⁰, e.g. use of inorganics in cement making, slags in construction, etc.



Example of Useful byproduct (Food Industry)

Armenia, Aragatsotn region, Aghdzk community



In “Ashtarak Dzu” LLC, due to organization of: 1. Egg powder production (from rational and technical eggs, returned or overproduced useful eggs) and 2. Poultry meat powder (meat meal fodder) production (recycling of dead chicken and other wastes) the generation of waste will be annually reduced by around 25 tons. Business benefits will simultaneously increase by several indicators.

RECP tools used: Useful byproduct, Good housekeeping and On-site reuse and recycling.
RECP measures business benefits: Productivity increase and Licence-to-operate, RECP environmental benefits: Reduction and utilization of waste.

*"Your well-being depends on your own decisions."
John Rockefeller*

²⁰ Physically close mutually beneficial interaction between the two organisms.

8.

Product modification

Redesign product in order to reduce its environmental impact during production, use and/or disposal.

Typical examples and solutions

- ✓ Design for optimal product lifetime,
- ✓ Design for minimum use of water, energy, secondary materials, etc.
- ✓ Design for low-waste manufacturing and use of associated advanced technologies,
- ✓ Obtaining information on no waste production,
- ✓ Design for refurbishment and modernization of the product, with the possibility to recycle the wastes generated during the production process with no adverse impact on the environment and people's health.



Product modification example (Production of Construction Materials) Armenia, Tavush Region, Dilijan City



“Levon Avagyan” PE uses plastic waste materials in addition to PE’s annual additional waste processing opportunities. Dilijan based entrepreneurs produce roof tiles (single roof materials typical to Dilijan) made of thick cement mortar and sand mixed with the waste from plastic materials. The production of suggested roof materials containing solar battery elements is one of RECP advanced measures requiring large investments.

RECP tools used: Product modification and Technology change. RECP measures business benefits: Productivity increase and Improved product quality. RECP environmental benefits: Reduction and utilization of waste.

"Survival is not the strongest nor the most intelligent type, but the one that best adapts to change." Charles Darwin

RECP METHODOLOGY

RECP follows the principle of using environmentally friendly tools and methods for business prosperity accepted worldwide. Implementation of RECP tools and methods is necessary for any industry and any company operating in a market economy. RECP implementation will create a favorable situation regardless of the political environment, legal system imperfections and corruption risks, etc. present in the sphere or the country.

As a result of RECP implementation there are evident economic, environmental and social benefits for consumers, economic agents SME, government and the country as a whole.

Conceptually: Option generation through root source and cause diagnosis.

Procedurally: Preparation, initial and detailed assessment, feasibility studies and implementation.



RECP project application is especially important for Armenia, which is not rich with fossil resources, the goal of becoming a prosperous country and producing competitive goods may be achieved through developing mental and intellectual capacity and force.

Naturally, every businessperson, shareholder and head of production has the best outlook of the business he is engaged in, with all the problems included and tries to overcome all associated challenges. Pursuant to the saying, “the clever man learns from his own mistakes, the wise man learns from the mistakes of others”, RECP is called to be useful in such situations. No business owner will refuse to get an advice from a wise and experienced expert, especially the advisor like RECP that has been tested in many developed countries. Like an Armenian proverb “To serve for the wise, not to be pleasing to the stupid”.

The Victory Path



Aimed for domestication, adaptation and adoption of RECP in Armenia, development of RECP way of thinking, principles, terminology and embedding provided format and approach in Armenia: RECP center will be established in Yerevan to assist the processes. Targeted to engage and refine - Forums will be organized with participation of stakeholders, involved ministries, governmental, private and non-governmental organizations, SMEs and other partners.

Many RECP clubs will be established in different regions of the country in order to domesticate, embed, strengthen and create a habit of the resource efficiency and clean production lifestyle in Armenia.

"It's good to have productive hands of expressive lips." Start to Act...

Annex 1. Measures proposed and implemented in RA enterprises during RECP pilot program

RECP initiated / implemented measures

“Ashtarak Dzu” LLC <http://ashtarakdzu.am/>

Armenia, Aragatsotn Mars, Akhdzk community



“Ashtarak Dzu” LLC is one of the leading companies in egg production industries of the republic, occupying over 8% of the market. Annual egg production is 43.5 eggs or 3.6 eggs monthly average, and meat 61.8 t per year.

		Materials				Energy Savings					
		Egg powder production organization	Flour forage fodder production	Optimization of chicken feed distribution regime	Recovering heat from the ventilation system	Replacement (fuel switch) of electrical energy heaters with natural gas ovens	Changing the internal inefficient incandescent lamps with more efficient bulbs	Aviaries envelope walls and roof insulation	Replacement of external lighting system with efficient one	Solar photovoltaic panels use	Poultry Manure Treatment for cogeneration
Business Case	Cost savings	-	-	+	+	+	+	+	+	+	-
	Productivity increase	+	+	+	-	-	+	-	-	-	-
	Improved product quality	-	-	+	-	-	+	-	-	-	-
	Organizational efficiency	-	-	+	-	-	+	-	-	-	+
	Licence-to-operate	+	+	-	-	-	-	-	-	+	+
Environment Benefit	Materials	+	+	+	-	-	-	-	-	-	+
	Water	-	-	+	-	-	-	-	-	-	-
	Energy	-	-	-	+	+	+	+	+	+	+
	Waste	+	+	+	-	-	-	-	-	-	+
	Effluents	-	-	-	-	-	-	-	-	-	-
Technique	Emissions	-	-	-	+	+	+	+	+	+	+
	Good House-keeping	+	+	+	+	+	+	+	+	+	+
	Input Material Change	-	-	+	+	+	-	+	-	+	+
	Better Process Control	-	-	+	+	-	-	-	-	-	-
	Equipment Modification	-	-	-	-	+	+	+	+	+	-
	Technology Change	-	-	+	+	+	+	+	+	+	+
	Onsite Reuse & Recycling	+	+	-	+	-	-	-	-	-	+
	Useful Byproduct	+	+	-	-	-	-	-	-	-	+
	Product Modification	+	-	+	-	-	-	-	-	+	+
Further comments and/or lessons learned	Continuously applying RECP measures include production process optimization, installation of new equipment for recycling of resources and reduction of energy use, potentially amounting to AMD 35.0 mln per year. Additional benefits, comprising social and environmental aids were improvements in working practices and a reduction of the company's carbon footprint.										

RECP initiated / implemented measures

“Arame & Sofi” LLC

Armaenia, Ararat Marz. Lusagyugh

Main accent is being done on cheese production, developing possibilities of matzoun too. Despite of the production is currently on going and during summer months (the most overloaded) it was processing 2.0 – 3.0 ton of milk per day; it has 6.0 – 7.0 ton possible capacity. Cheese production was chosen to conduct RECP study within this pilot project.

RECP initiated / implemented measures		Materials Efficiency			Energy Savings			Water Savings		
		Installation of air ionizers	Installation of air & water disinfection systems	Energy source heating system changes	Insulation pipes and boilers	Covering the open lid surface of boilers	Refrigerator-stock restructuring.	Wastewater (whey) recycling for fats (butter) production	Wastewater (whey) recycling for animal feeding	Wastewater (whey) recycling using as an irrigation water
Business Case	Cost savings	+	+	+	+	+	+	-	-	+
	Productivity increase	+	+	-	-	-	-	+	+	-
	Improved product quality	+	+	-	-	-	-	-	-	-
	Organizational efficiency	-	-	+	-	+	-	+	+	+
	Licence-to-operate	+	+	-	-	-	-	-	-	-
Environment Benefit	Materials	+	+	-	-	-	-	+	+	+
	Water	-	-	-	-	-	-	+	+	+
	Energy	-	-	+	+	+	+	-	-	-
	Waste	+	+	-	-	-	-	+	+	+
	Effluents	-	-	-	-	-	-	+	+	+
Technique	Emissions	-	-	+	+	+	+	-	-	-
	Good House-keeping	+	+	+	+	+	+	+	+	+
	Input Material Change	-	-	+	-	-	-	+	+	+
	Better Process Control	+	+	+	-	-	-	+	+	+
	Equipment Modification	-	-	+	+	-	+	-	-	-
	Technology Change	+	+	+	-	-	-	+	+	+
	Onsite Reuse & Recycling	-	-	-	-	-	-	+	+	+
	Useful Byproduct	-	-	-	-	-	-	+	+	-
Product Modification	-	-	-	-	-	-	+	+	-	
Further comments and/or lessons learned	Through raising awareness and capacity building at “Arame & Sofi” LLC, exchange/management of knowledge in regard to RECP principles and concept was applied in practice. This program served as good incentive for entrepreneur to start own observations and make the system “smart” to ensure profitable production as soon as possible.									

RECP initiated / implemented measures

“Ararat Abrikon” LLC <http://abrikon.com/>



Factory of alcoholic beverages. Armenia, Ararat region, Ararat village. Abrikon is a special quality, environmentally friendly strong apricot beverage with exquisite taste and aroma. It is made from delicious apricots settled under the eye of the sun in Ararat valley and the water from the high mountains of Armenia.

Business Case

Cost savings

Productivity increase

Improved product quality

Organizational efficiency

Licence-to-operate

Environment Benefit

Materials

Water

Energy

Waste

Effluents

Emissions

Technique

Good House-keeping

Input Material Change

Better Process Control

Equipment Modification

Technology Change

Onsite Reuse & Recycling

Useful Byproduct

Product Modification

Further comments and/or lessons learned

The “Ararat Abrikon” Company has acknowledged the recommendations and underlined, that to this date, they have not been aware of the potential solutions to reduce resource inefficiencies. Actually, for embarking on a committed path of resource efficiency and clean production per avoided cleaning of equipment, the company would need in-depth cost analysis which would monetize not only the expenditures of technical and procedural upgrades, but also monetize the resource savings to the benefit of the company.

Materials Efficiency

Energy Savings

Water

The kernel of apricots may be used locally in confectionary production

The pits, stones and other agricultural solid waste may be utilized by composting

Utilization of the distilled apricot waste for production of bio-humus

Installation of high efficiency Steam Boiler

Establish the system for condensate collection and return (steam traps.)

LED lamps or high efficient high-pressure sodium lamps

Switch of the heating system in office building from electricity to natural gas

Office building attic thermal insulation

Thermal insulation of external walls

Installation of solar water heaters

Made possible to reuse the artesian water effluents for irrigation

	The kernel of apricots may be used locally in confectionary production	The pits, stones and other agricultural solid waste may be utilized by composting	Utilization of the distilled apricot waste for production of bio-humus	Installation of high efficiency Steam Boiler	Establish the system for condensate collection and return (steam traps.)	LED lamps or high efficient high-pressure sodium lamps	Switch of the heating system in office building from electricity to natural gas	Office building attic thermal insulation	Thermal insulation of external walls	Installation of solar water heaters	Made possible to reuse the artesian water effluents for irrigation
Business Case	+	+	-	-	-	+	+	+	+	-	-
Environment Benefit	-	-	+	+	+	-	-	-	-	+	+
Technique	+	+	+	+	+	+	+	+	+	+	+
	+	+	-	-	-	+	-	+	+	-	-
	+	+	-	-	-	+	+	+	+	-	-
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	+	+	-	-	-	+	+	+	+	-	-
	-	-	+	+	+	-	+	-	-	+	+
	-	-	+	+	+	-	+	-	-	+	+
	-	-	+	+	+	-	-	-	-	+	+

RECP initiated / implemented measures

“Agricultural Association Lukashin” Consumer Cooperative

Armenia, Armavir Marz. Lukashin

The main activity of the SME is production of dried fruit from technical grade and table sorts of fruits (apricots, peaches, plums, apples, pears, figs and grapes) and melons grown on the lands of Lukashin rural community located in the heart of Ararat valley, famous for the taste qualities of its fruits and vegetables. Average production capacity is 14,000 kg/year of finished produce (dried fruit) that are mainly consumed in the internal market and partly exported

Business Case

Cost savings

Productivity increase

Improved product quality

Organizational efficiency

Licence-to-operate

Environment Benefit

Materials

Water

Energy

Waste

Effluents

Emissions

Technique

Good House-keeping

Input Material Change

Better Process Control

Equipment Modification

Technology Change

Onsite Reuse & Recycling

Useful Byproduct

Product Modification

Further comments and/or lessons learned

Assisted by the RECP experts, a concept-proposal for a follow-on project on high-cost RECP recommendations, namely, installation of three convective solar dryer and a solar water heater has been developed, to be implemented under GEF/UNDP Small Grants Program 2015. This successful case created a precedent for a RECP model that can be replicated in other dried-fruit-producer SMEs of Armenia, by disseminating the proven RECP practices and building capacities to bring in “green” production culture.

Materials Efficiency

Energy

Water

Sulfur product packaging instead of using nitrogen.

Fruits preliminary treatment without the use of caustic soda

The unavoidable plant waste (stalk, peel, pit, seeds, pulp), is used as fresh forage for livestock

The kernel of apricots is used locally in confectionary

The pits / stones and other agricultural solid waste are utilized by composting

Ventilation pipes (for water vapour removal) modification

Reuse the effluents (without caustic soda) for irrigation

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RECP initiated / implemented measures

“Agricultural Association Yervandashat” Consumer Cooperative
Armenia, Armavir Marz. Yervandashat

The main products, dried fruit are from local raw materials: apricot fruit ("SATENI" type), peaches (Ararat valley and cultivated current and later scores), pears (mainly the "beauty of the forest"), black plums (three species), and cherries. The majority of the products sold in the domestic market and the Russian Federation

		Materials Efficiency				Energy Savings			Water
		Expanding the production base of raw materials	Flavored water from the dryer may be used for the purpose of manufacture of perfumes	The solid waste used as fertilizer	Soft waste is used as fresh forage for livestock	Dried fruit production technology change, through a combination of electric and solar dryers	Dryer ventilation system modification	Installation of two-tier tariff meter for electricity	Implementation of drip irrigation
Business Case	Cost savings	+	-	-	-	+	+	+	+
	Productivity increase	+	+	+	+	+	-	-	-
	Improved product quality	+	-	-	-	+	-	-	-
	Organizational efficiency	+	+	+	+	-	+	+	+
	Licence-to-operate	-	-	-	-	+	-	-	+
Environment Benefit	Materials	+	+	+	+	-	-	-	-
	Water	-	+	-	-	-	-	-	+
	Energy	-	-	-	-	+	+	+	+
	Waste	+	+	+	+	-	-	-	-
	Effluents	-	+	-	-	-	-	-	+
	Emissions	-	-	-	-	+	+	+	+
Technique	Good House-keeping	+	+	+	+	+	+	+	+
	Input Material Change	-	-	+	+	+	+	-	+
	Better Process Control	+	+	-	-	-	+	+	+
	Equipment Modification	-	-	-	-	+	+	-	-
	Technology Change	-	-	-	-	+	+	-	+
	Onsite Reuse & Recycling	-	+	+	+	-	-	-	-
	Useful Byproduct	-	+	+	+	-	-	-	-
	Product Modification	+	+	+	+	-	-	-	-

Further comments and/or lessons learned As a result of RECP assessment the company has benefited from reduction in water and energy consumption by improving efficiency of irrigation system, and modification of electric dryers. Options regarding improvement of product marketability, development of the side products (flavored water to be used in manufacture of perfumes), as well as alternative use for water for supplying other industries were suggested. Besides the economic and environmental benefits mentioned above, the RECP programme brought improvements in working practices and overall image of the company.

RECP initiated / implemented measures

“Marila” LLC

Armenia, Syunik Marz, Kapan city



“Marila” LLC started implementing cleaner production in 2014, was established in 2010. Since then, “Marila” has been one of the most demanded and successful dairy and meat production companies in Armenia. The company pays lots of attention to the quality of the product, and has set up high standards of operations. 70% of “Marila: dairy products, such as matzoun, cheese, curd, sour cream, milk

and tan are consumed in Syunik region, and the rest 30% in Yerevan

Business Case

Cost savings

	Materials Efficiency	Energy Savings	Water
	Replacement and modification of production equipment	Replace plastic containers with environmentally friendly bags	Bottle filling system modification
	Production lines for milk moves through the compressed air instead of water	Serving market research	Installation of the lighting system sensors in the maintenance workshop
	Refrigerator outer wall insulation and light hole covering	Install thermo regulators on the radiators of the heating system	Wash water use for irrigation
Productivity increase	+	-	+
Improved product quality	+	+	-
Organizational efficiency	-	-	+
Licence-to-operate	+	+	-
Materials	+	+	+
Water	+	-	+
Energy	+	-	+
Waste	+	+	+
Effluents	+	-	+
Emissions	+	-	+
Good House-keeping	+	+	+
Input Material Change	-	+	-
Better Process Control	-	-	+
Equipment Modification	+	-	-
Technology Change	-	+	+
Onsite Reuse & Recycling	-	-	-
Useful Byproduct	-	-	-
Product Modification	-	+	-

Further comments and/or lessons learned

RECP assessment has suggested the following options for improvement of resource efficiency/use and cleaner production practices within Marila company: elimination of harmful emissions, reduction in the energy consumption through equipment modification, prevention of water and raw material loss through equipment modification and introduction of new technologies, waste recycling options, improvement of market assessment. Company could potential improve co-operation schemes and its marketability trough the reduction of waste and unitization to be reduce the loss of produce (matzoun, sour cream and milk).

RECP initiated / implemented measures

“Sam-Har” Ltd www.sipan.am Armenia, Kotayq region, Abovyan city.



The Ltd was founded in 2002. The company has chosen “Sipan” brand for its products. After successful entry to the market, the company launched its new production line for mineral water bottling in 2006 and introduced Sipan’s masterpiece to the market – fruit compotes together with preserved jams, pickled cans, which soon became the

company’s fastest selling and best products.

		Materials Efficiency			Energy Savings			Water		
		After drying quince core and pomegranate peel, sell them to tea manufacturers.	Collect organic wastes (except apricot and peach stones) and make bio humus in the Company’s area	Process (break) apricot and peach stones and sell to food, perfume, creams, scrub, or forage manufacturers.	Replace the lamps for lighting of manufactory and the administrative area with LED lamps.	Separate the finished product storage area from the general manufactory area and during wintertime heat only the storeroom.	Optimize the storage spaces, which will allow saving energy.	Treat the water for washing of raw materials by settling and use for irrigation purposes.	A basin for storage of water for washing is to be constructed within the manufactory area and irrigate the garden.	
Business Case	Cost savings	-	-	-	+	+	+	+	+	+
	Productivity increase	+	+	+	-	-	+	-	-	-
	Improved product quality	-	-	-	-	+	+	-	-	-
	Organizational efficiency	+	+	+	-	+	+	-	-	-
	Licence-to-operate	+	-	-	+	-	-	-	-	-
Environment Benefit	Materials	+	+	+	-	+	+	-	-	-
	Water	-	-	-	-	-	-	+	-	+
	Energy	-	-	-	+	+	+	-	-	-
	Waste	+	+	+	-	+	+	-	-	-
	Effluents	-	-	-	-	-	-	+	-	+
	Emissions	-	-	-	+	+	+	-	-	-
Technique	Good House-keeping	+	+	+	+	+	+	+	+	+
	Input Material Change	-	+	-	+	-	-	+	-	+
	Better Process Control	+	-	+	-	-	-	+	-	+
	Equipment Modification	-	-	-	+	+	+	-	-	-
	Technology Change	-	-	-	+	+	+	-	-	-
	Onsite Reuse & Recycling	-	+	+	-	-	-	+	-	+
	Useful Byproduct	+	+	+	-	-	-	-	-	-
Product Modification	+	+	+	+	-	-	-	-	-	
Further comments and/or lessons learned	The RECP Demonstration Project in Armenia, besides the economic and environmental benefits, brought improvements in working practices and overall image of the pilot company. Besides that, the implementation of suggestions will provide the decrease of fruit compotes price, the rise of preserved jams and pickled cans quality growth, decrease in water discharge, and production growth due to wise measures proposed for materials, energy and water usage.									

RECP initiated / implemented measures

“HATM” House Components Manufacturing Factory LLC

Armenia, Shirak Marz, Mayisyan

“HATM” House Components Manufacturing Factory LLC (the former Armenian-American Housing Manufacturing entity) of “Hayastan” All-Armenian Foundation was established in 1991 by joint efforts of the Government of Republic of Armenia and

Armenian Assembly of America. One of the main directions of production of the enterprise is considered the production of school, office and kitchen furniture. Elite furniture for apartments also produced here.

Business Case

Cost savings

Productivity increase

Improved product quality

Organizational efficiency

Licence-to-operate

Environment Benefit

Materials

Water

Energy

Waste

Effluents

Emissions

Technique

Good House-keeping

Input Material Change

Better Process Control

Equipment Modification

Technology Change

Onsite Reuse & Recycling

Useful Byproduct

Product Modification

Further comments and/or lessons learned

As the company has downsized operations, the operational procedures have followed the same routine, which due to lost scale effect, has resulted in major inefficiencies. The Company management has started implementing recommendations and has seized some of the lowest cost opportunities first and foremost as a way to increase cost-competitiveness and reduce operational losses. Should affordable financing become available, the proposed measures will help the enterprise not only improve resource efficiency and stem for cleaner production, but also improve economic viability of the firm.

Materials Efficiency

Energy Savings

Equipment productivity compliance with existing orders

Re-use of manufacturing defects and waste

Wood pellet or briquettes production based on wood waste

Production process framework focus in one compact area

Optimization of production areas

Electricity supply system in line with current demand

Reduce administrative heated space

Cost savings	+	+	-	+	+	+	+
Productivity increase	+	+	+	-	-	-	-
Improved product quality	-	-	-	-	-	-	-
Organizational efficiency	+	+	+	+	+	+	+
Licence-to-operate	-	-	+	-	-	-	-
Materials	+	+	+	-	-	-	-
Water	-	-	-	-	-	-	-
Energy	+	-	+	+	+	+	+
Waste	+	+	+	-	-	-	-
Effluents	-	-	-	-	-	-	-
Emissions	+	-	+	+	+	+	+
Good House-keeping	+	+	+	+	+	+	+
Input Material Change	-	+	+	-	-	-	-
Better Process Control	+	+	+	+	+	+	+
Equipment Modification	+	-	-	-	-	-	-
Technology Change	-	-	-	-	-	-	-
Onsite Reuse & Recycling	-	+	+	-	-	-	-
Useful Byproduct	-	-	+	-	-	-	-
Product Modification	-	-	-	-	-	-	-

RECP initiated / implemented measures

“Meghratoun” Ltd Armenia, Lori region Vanadzor City

Engaged in the production of honey for several decades. Honey-making families are concentrated around Lori’s fertile forests and fields, where bees collect environmentally clean and healthy honey. In this regard, “Meghratoun” prefers preserving the immaculacy of honey and supply exceptionally high quality product to the public. Honey is used not only in food, but also for medical purposes.

		Materials Efficiency			Energy Savings			
		Equipment modification, renovation of old worn-out main production equipment	Replacement of internal inefficient lighting with efficient LED lamps	Replacement of windows and doors with energy efficient ones [R-value up to 0.4 (m2*0C)/ W]	Thermal insulation of walls and attic (preliminary insuring repair work of the roof for avoiding humidity in the insulation layer)	Fuel switch for heating from electricity to natural gas by connection to the natural gas wall hang boiler with water circulation system for space heating and second circuit for hot tap water	Installation of 1.5 m2 split solar water heater system with 12 vacuum tubes and 500-litre tank	A system of of 1 kWp PV panels installation on the roof of the building.
Business Case	Cost savings	+	+	+	+	+	+	+
	Productivity increase	+	+	.	+	.	.	.
	Improved product quality	.	+	+	+	+	.	+
	Organizational efficiency	+	.	.	+	.	.	.
	Licence-to-operate	+	+	.	.	.	.	.
Environment Benefit	Materials	+	+	.	.	.	.	.
	Water	.	.	.	.	.	.	.
	Energy	.	.	+	+	+	+	+
	Waste	+	+	.	.	.	.	.
	Effluents	.	.	.	.	.	.	.
Technique	Emissions	.	.	+	+	+	+	+
	Good House-keeping	+	+	+	+	+	+	+
	Input Material Change	.	.	.	.	.	.	.
	Better Process Control	+	+	+	+	.	.	.
	Equipment Modification	.	+	.	+	+	+	+
	Technology Change	+	+	+	+	+	+	+
	Onsite Reuse & Recycling	.	.	.	.	.	.	.
	Useful Byproduct	.	.	.	.	.	.	.
Product Modification	.	.	.	.	.	.	.
Further comments and/or lessons learned	RECP project methodologically helps the company both in the stage of design and performance to handle the problem of reducing waste, increasing the efficiency of the raw materials and energy usage resulting economic and ecological achievements. Namely, reduction of pollution, waste, improvement of technology, cutting and grinding process modification and sanitation improvement measures were recommended because of RECP assessment.							

RECP initiated / implemented measures

"Kashi" OJSC

Armenia, Yerevan, Erebuni District



The mill retained the old tradition. It operates in very competitive conditions with Turkish and Iranian products. Factory-treatment plant reconstruction made possible convenience sales opportunities in international markets for finished products and materials.

Materials Efficiency

Energy Savings

Water

		Raw materials surplus use as an additive for forage	Raw materials surplus use as an organic fertilizer	Processing of raw material surplus for receiving liquefied natural soap	Production of two types (finished leather and suede / chamois) products from raw leather	Hot-water heater replacement condensing boiler on natural gas	Installation of solar water heaters for hot water generation	Water treatment system improvements
Business Case	Cost savings	-	-	-	+	+	+	-
	Productivity increase	+	+	+	+	+	-	-
	Improved product quality	-	-	-	-	-	-	-
	Organizational efficiency	+	+	+	+	-	-	+
	Licence-to-operate	-	-	-	-	-	+	+
Environment Benefit	Materials	+	+	+	+	-	-	-
	Water	-	-	-	-	-	-	+
	Energy	-	-	-	-	+	+	-
	Waste	+	+	+	+	-	-	-
	Effluents	-	-	-	-	-	-	+
Technique	Emissions	-	-	-	-	+	+	-
	Good House-keeping	+	+	+	+	+	+	+
	Input Material Change	+	+	+	+	+	+	-
	Better Process Control	-	-	-	-	-	-	+
	Equipment Modification	-	-	-	-	+	+	-
	Technology Change	-	-	-	+	+	+	+
	Onsite Reuse & Recycling	+	+	+	+	-	-	+
	Useful Byproduct	+	+	+	+	-	-	-
Product Modification	+	+	+	+	-	+	-	

Further comments and/or lessons learned

RECP assessment has suggested the following options for improvement of resource efficiency/use and cleaner production practices within "Kashi" company: elimination of harmful emissions and effluents, reduction in the energy consumption by improving the equipment modification, utilization of waste and wastewater effluents treatment, improvement of product marketability are accepted and implemented in "Kashi" company.

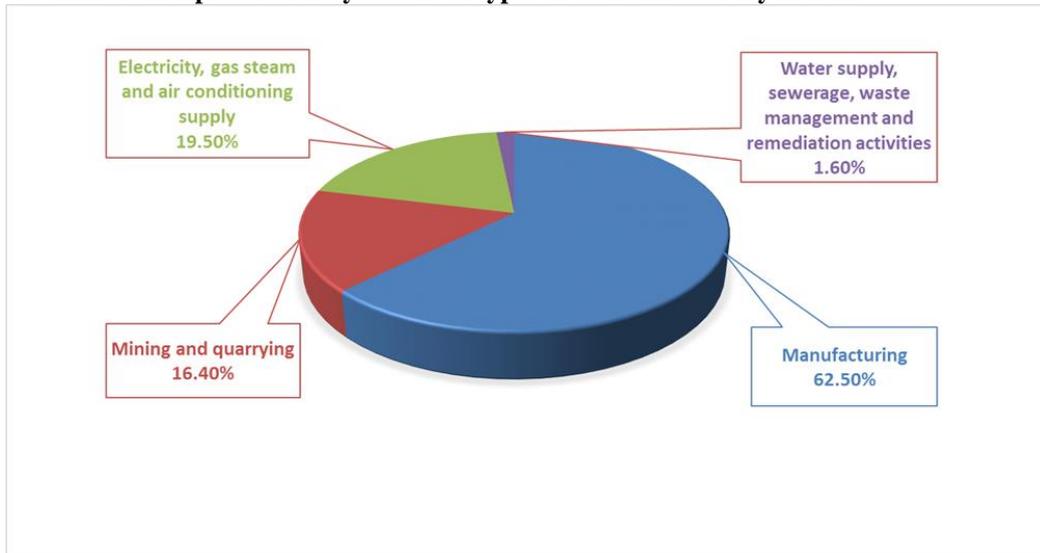
Annex 2. Summary information on industrial and environmental situation in Armenia

Industry

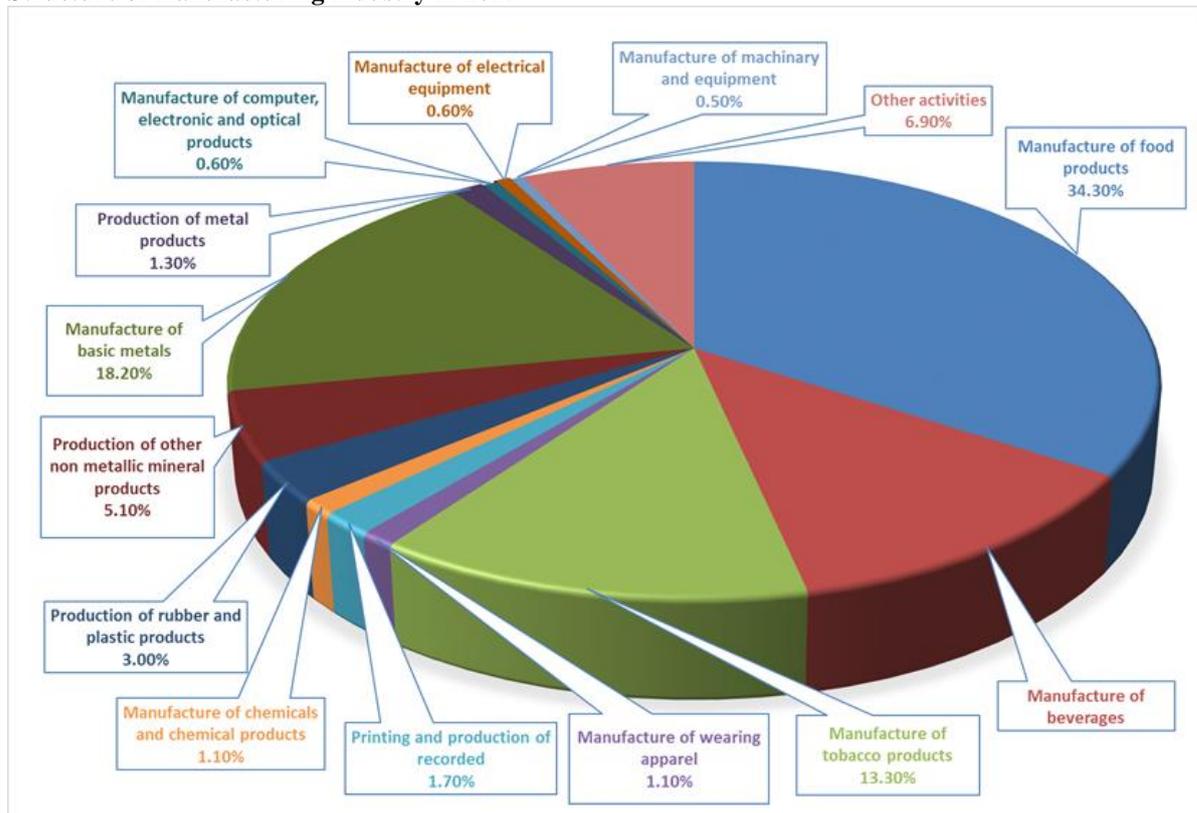
According to official sources, industry comprises that base of Armenian economy. The government of RA follows the goal of increasing the competitiveness of Armenian economy and achieving continuous economic growth. The government admitted the necessity to construct a knowledge-based economy and initiated an export oriented policy implementation.

The industrial production of RA by economic activity types and the structure of manufacturing sector are shown below:

Structure of industrial production by sectors of types of economic activity in 2015



Structure of manufacturing industry in 2015



Analysis of production is crucial for industrial companies.

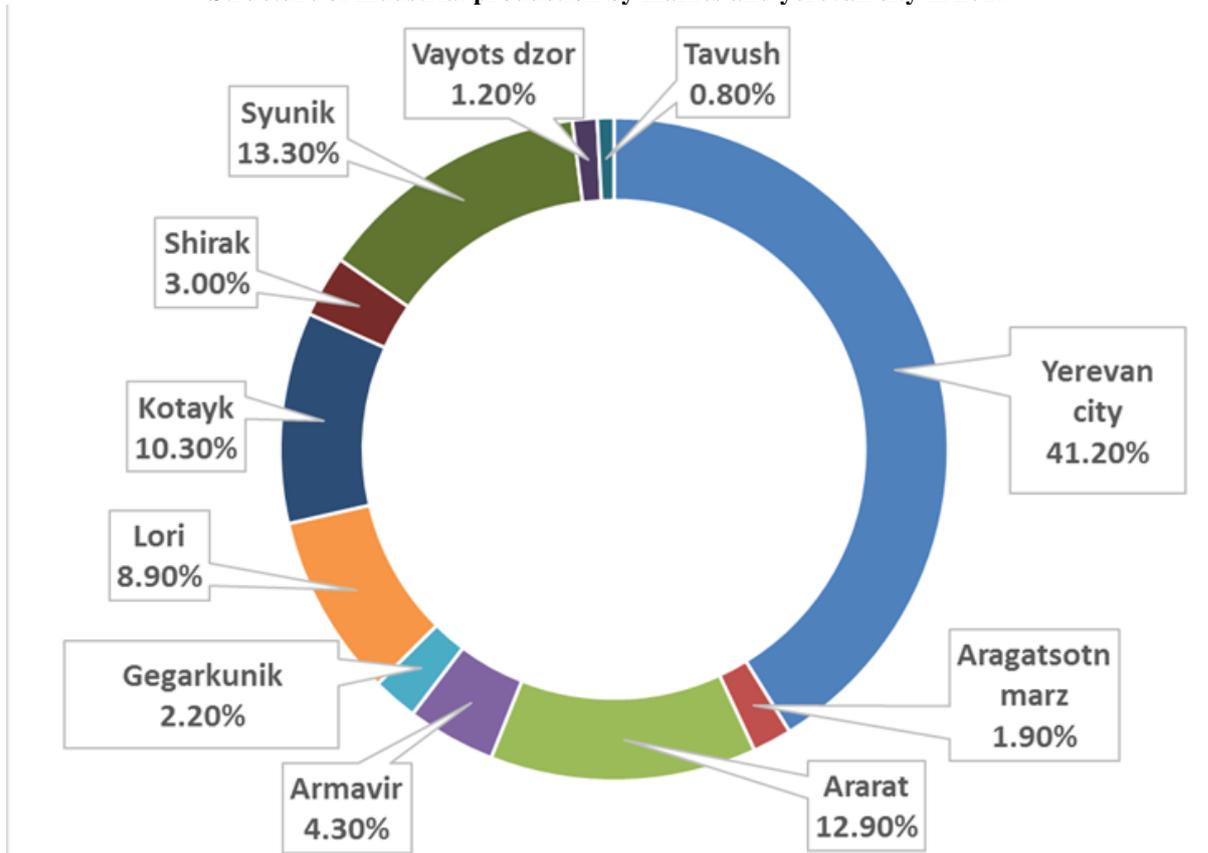
The following objectives are set during the analysis:

- Perform market analysis,
- Analyze the assortment of goods, its structure, quality and symmetry,
- Define the impact of various factors on the volumes of output.

Analytical research is carried out basing on following information sources:

- Business plan,
- Report on output,
- Report on fixed assets,
- Report on inventory stocks,
- Data from marketing service,
- Accounting data.

Structure of industrial production by marzes and yerevan city in 2015



Continuous improvement of competitiveness in the economy is one of the priority issues in a country's economic policy. Competitiveness provides a favorable environment for economic activity, development of markets and their coherence with internationally accepted standards, for broader fulfilment of the society's vital needs as well as for fair protection of consumers' interests.

In recent years, some effective steps towards ensuring sufficient conditions for honest competition, improvement of business environment, development of SME sector have been undertaken in Armenia, which is reflected in various ratings granted by international organizations.

Environmental issues

As a UNFCCC Non-Annex I country, Armenia does not have quantitative commitments for GHG emission reduction. However, to support the objective of the Convention and, given that slowing GHG emissions is in line with the country's economic, energy, and environmental objectives, Armenia is implementing and, in its development perspectives, is planning climate change mitigation measures.

Several laws and bylaws were amended and adopted, national and sectorial development projects, that are based on sustainable and low Carbon development are drafted and implemented in Armenia in recent years.

Laws: RA Law "On Atmospheric Air Protection", RA Law "On Energy", RA Law "On Energy Efficiency and Renewable Energy", RA Law "On Waste", Forest Code of RA, etc.

RA Government Decisions: On the approval of norms for maximum permissible concentrations (MPC) of air-polluting substances in settlements, and maximum permissible concentrations of dangerous substances in exhausts from motorized transport, etc.

Government policy on waste is directed on reduction of waste generation and minimization of waste danger through following measures:

- Use of contemporary scientific achievements to introduce no waste or low waste technologies;
- integrated utilization of material resources in order to reduce waste volumes;
- Direct, secondary or alternative consumption of waste bearing material value;
- Ensuring safe disposal of non usable waste with appropriate waste neutralization technologies, developing environmentally safe methods and measures;
- Providing available information on waste utilization;
- Define mechanisms for economic motivation

Armenia does not have own energy resources and mainly imports fuel to meet internal demand.

The main type of fuel is natural gas (around 80% of total). The structure of RA fossil fuel consumption by types and the structure of CO₂ emissions by category²¹ generated by energy sector²² are shown in the graphs below.

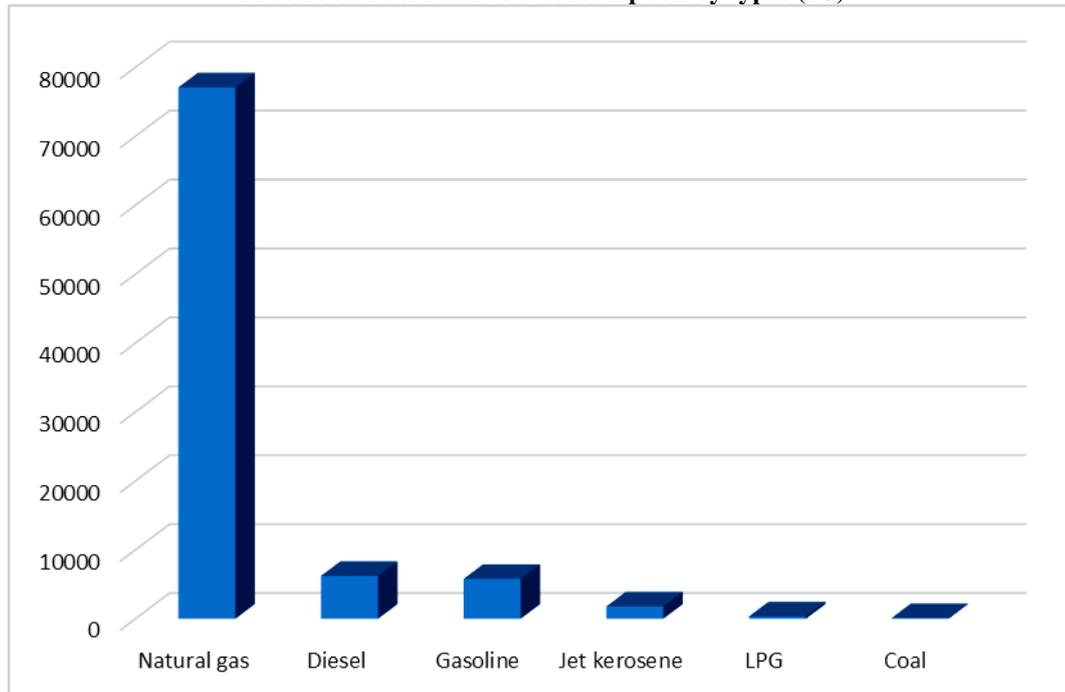
Main issues in ensuring energy security of RA are the following:

- Creating conditions for sustainable development of RA ;
- Ensuring a self sustained electric power system and developing export potential in the region;
- Creating favorable investment climate in the sectors of renewable and alternative energy, nuclear power ;
- Ensuring energy efficiency and energy conservation;
- Reduction of GHG emissions,
- Developing concepts aimed at preserving the stated level of energy security in RA.

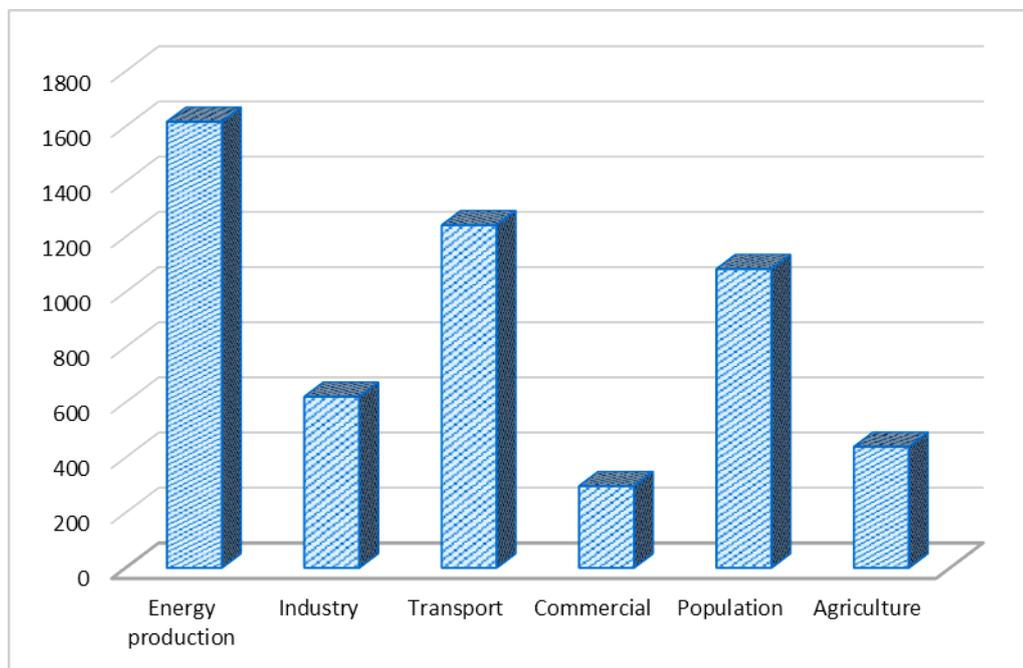
²¹ According to the IPCC classification, "Energy" sector includes fuel combustion-related functions ;

²² These are the most recent official data for 2012, however later years energy resources consumption structure has remained virtually unchanged.

The structure of fossil fuel consumption by types (TJ)



The structure of CO₂ emissions by category generated by energy sector (Gg)



Main directions of ensuring energy security of RA are the following:

- Developing the system ensuring energy security,
- Ensuring efficient and rational exploitation of renewable energy resources;
- Promoting nuclear power;
- Regional integration of energy systems and diversification of energy resources supply;

- Financial sustainability of energy sector and ensuring stated level of economic efficiency;
- Ensuring energy security in emergencies and during wars.

In order to adjust the economy to changing environment and to mitigate the impact of climate changes on water resources the following complex measures are suggested for implementation:

- Administrative and planning
 - consider the climate change factor during development of management plans for all major river drainage basins;
 - optimization and renovation of the hydrologic observation decks network with contemporary equipment;
 - granting water usage permissions taking into account the climate change risks;
 - creating hydrologic reservations in all river basin areas of river flow formation;
- Informative and research.
 - assessment of climate changes on water resources of mountain lakes;
 - assessment of the snow storage change for all major river drainage basins in Armenia, application of computer modeled climate change scenarios for all major river drainage basins;
 - assessment of climate changes on underground waters;
 - amendment of ecologic flow calculation method;
- Economic and technical.
 - construction of new small reservoirs and renovation of out of-service ones;
 - monitoring and controls over underground waters;
 - reduction of flow losses in water supply and irrigation systems;
 - develop economic mechanisms to promote application of advanced irrigation methods in agriculture.

Currently there are no projects for renovation and reconstruction of waste water treatment systems in Armenia.



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